

INTEGRATING FARMER'S EXPERIENCES USING INDIGENOUS KNOWLEDGE TO ADAPT TO FLOODS IN SUSTAINABLE DEVELOPMENT IN MEKONG DELTA, VIETNAM (A CASE STUDY IN AN GIANG PROVINCE)

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ABSTRACT

This research was carried out to explore the role of the appropriateness of farmer's local knowledge and their adaptive capacity to floods in An Giang province. KAP (Knowledge-Attitude-Practice), PRA (KIP and focus group discussion) and household survey have been applied to collect data. The results showed that local people used several effective local knowledge's for coping with floods. However, the valuable local knowledge has not been recorded yet, nor documented in written materials for sharing to young generation and communities; some indigenous practices are not suitable with the current requirement for flood adaptation strategies.

Keywords: Climate change, local knowledge, flood, adaptation

INTRODUCTION

Climate change caused serious damages for livelihood of local people such as flood, drought, and salinity intrusion (Phu and Tran, 2014; UNDP, 2016). In An Giang province, local people influenced by the annual floods, especially the downstream of the Mekong River Basin, has been severely impacted by upstream disturbance due to presence of upstream reservoirs (Thong, 2017). That has caused considerable difficulties for flood management in this area (Can and Nguyen, 2016). In this case, indigenous knowledge, the knowledge gained over time through experience (Warren, 1991; Judith Ehlert, 2010) has been used to adapt with these changed. However, the fact that there has not had many systematical research and evaluation relevance system to indigenous knowledge to adapt to flooding changes in agricultural production in the study area in the scene of climate change. Therefore, the research *"Integrating farmer's experiences using*

indigenous knowledge to adapt to floods in sustainable development in Mekong Delta, Vietnam: A case study in An Giang province" was conducted to explore the role and contribution of indigenous knowledge in adaptation with the change of the flood. The results of the research will be the basis for the application and conservation of indigenous knowledge, as well as the scientific basis for further studies to help bring solutions to minimize the impact of abnormal floods on agricultural production.

RESEARCH OBJECTIVES

Generally, the main purpose of the study is that to provide information on farmer's indigenous knowledge and their adaptive capacity to floods in An Giang province provide a scientific foundation for proposing solutions and policies to conserve and enhance the use of indigenous knowledge in reducing the vulnerability of people living in flooded areas and livelihood

strategies of flood affected people are both effective and sustainable.

The research will focus on the specific objectives below:

1. To systematize and evaluate the suitability of indigenous knowledge and the ability of farmers to adapt to floods in different conditions.
2. To propose conservative measures and promote the value of using indigenous knowledge of farmers in An Giang province.

RESEARCH QUESTIONS

The research is focusing to answer the following questions:

1. What is farmer's indigenous knowledge in applying to floods of different zone ?
2. What are proposing solutions to conserve and enhance the use of indigenous knowledge in reducing the vulnerability of people living in flooding areas and livelihood strategies of flood affected people are both effective and sustainable?

RESEARCH METHODS

To achieve objectives provided, the study was analyzed and evaluates the status of traditional knowledge of farmers to adapt to floods in different conditions from different information sources. The information was collected by using a combination of quantitative and qualitative research methods. In particular, qualitative research methods including carrying out the evaluation with the participation of people and using the following tools such as Timeline; Seasonal Calendar; Venn Diagram; Problem Ranking Matrix; and detailed interviews of local leaders. The following methods have been done:

Literature review: to refer the previous researches and reports which related to climate change, the status of drought and its impact, especially in the Mekong delta.

Both the quantitative and qualitative methods were used for survey. The research was done following these methods: in - depth interview (for both local authorities and local people), focus group discussions and questionnaires.

In - depth interview: the team has conducted in depth interviews those people who are representative of local authorities at the three levels (province, district and commune). By interviewing, the general information about the how local people know about flood and their actions to cope with it will be understood. In addition, the demand of local people may be found out in this step. Also, individual people who showed appreciable knowledge of environment change were selected for in-depth interviews. The interviews focus on the story of using their own knowledge to adapt with the effect flood. The in - depth interviews were conducted by using semi-structured questionnaires. Information were written down and recovered by voice recorder.

PRA (Participatory Rural Appraisal): the meeting was done, the participants for the meeting were 15 people. It was done in the upper zone (Phu Huu, Phuoc Hung communes), middle zone (Vinh An, An Hoa communes) and lower (Vinh Phuoc, Luong An Tra communes), An Phu, Chau Thanh, Tri Ton district, An Giang province. Therefore, these households have enough time to experience and accumulate local living experiences while gaining indigenous knowledge that has been applied to life experiences and to get a general understanding about the life of local people, their assets and also to know how they have faced with the flood in context of climate change. The criteria to people that they are farmers, who are experienced households living with floods and more than 50 years of living of study sites. These five tools were used: time line, mapping, seasonal calendar, problem tree, Venn diagram, ranking .The

participants are people doing in agricultural production in the community.

Questionnaires: Questionnaires is used to find out the damages of flood on the livelihood of local people, questionnaires mainly to identify current observed flood and its effects of such changes particularly on local livelihoods; the resources available to them, and the extents the traditional knowledge to help the people live and cope with the effects of flood. Interview local experienced households living with floods and more than 50 years of living of study sites such as: the upper zone (Phu Huu. Phuoc Hung communes), middle zone (Vinh An, An Hoa communes) and lower (Vinh Phuoc, Luong An Tra communes). Therefore, these households have enough time to experience and accumulate local living experiences while gaining indigenous knowledge that has been applied to life experiences. Totally, 360 questionnaires were done, the interviewees are divided into two groups: (i) people living in high dyke (180 households); (ii) people living in no dyke (180 households).

RESULTS AND DISCUSSION

The Situation of Using Indigenous Knowledge of the Local People in Flood Forecasting in Study Sites

Experiences have been used by people to forecast floods including observations of flood events in previous years; water color, wind direction; observing the expression of some species of plants, animals, insects. The results show that there is a difference in the proportion of people using these signs as a basis for flood forecasting in the three study areas (Figure 1 and Table 1). In upper zone, the percentage of people using these signs for flood prediction is higher than for the other two areas, the lowest is middle zone. In the signs to observe flood forecasts, observe water colors, plants and animals most used by the local people and at least local people used method is water measure.

Flood monitoring methods (cycle or time) and water measure for flood forecasting are used in upper zone.

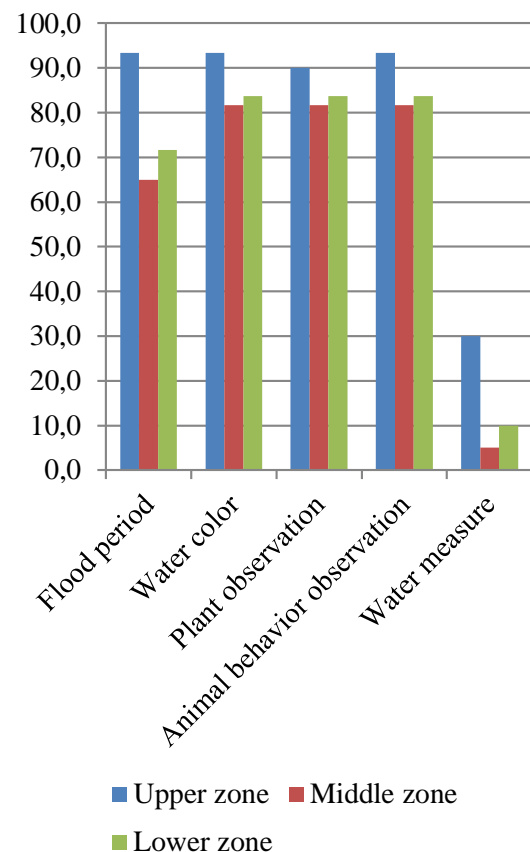


Figure 1. The Difference in People's Flood Forecasting in Flood Areas

Table 1. Signs for Rain Forecasting

Signs	Descriptions
Rain period change	<ul style="list-style-type: none"> - Rains start in the beginning of lunar March or April. - More rains take place during lunar June, July.
Night sky observation	<ul style="list-style-type: none"> - Gloomy sky or less stars means rain the day after.
Daytime sky observation	<ul style="list-style-type: none"> - Windy and cloudy with thunderstorms - Large pale blue clouds - Heavy, soaked or black clouds with cold winds

	<ul style="list-style-type: none"> - It was hot for several days
Animal behavior observation	<ul style="list-style-type: none"> - Dragonfly flying low means rain flying high means sun, flying in the middle means shady - Ants stay higher place or move their nests and eggs to higher places. - Winged ants appear, rains take place the day after. - Termites appear, rains take place the day after. - Flies and gadflies attack paddy fields, rains are about to take place.

The Situation of Using Indigenous Knowledge of the Local to Adapt to Floods in Agricultural Production

Currently, due to unusual and complex weather, unpredictable nature so the accuracy of flood and weather prediction is no longer as high as before, in addition to the impact of science and technology, the number of people with indigenous knowledge is not many. Specifically, 89.4,% of the interviewees said that the current flood situation is not predictable; 10.0% said that they change their predictions a little and only 13.3% said that the weather situation remains in their predictions (Figure 2).

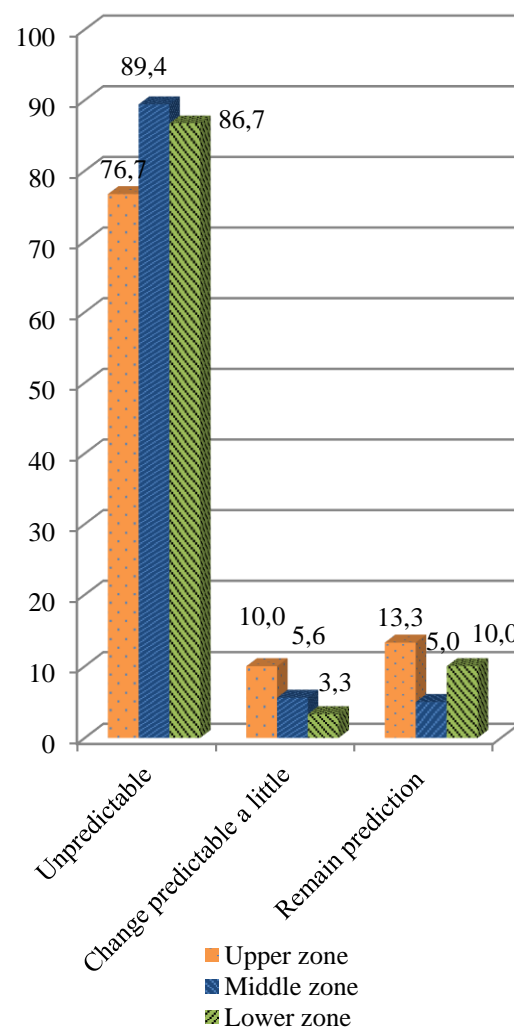


Figure 2: Assessing the Accuracy of the Predicted Flood and Weather Local People

Assessing of Stability for Using Farmer's Traditional Knowledge and Adaptive Capacity to Floods in Agriculture Production

Assessing of Stability for Farmer's Indigenous Knowledge in Flood Forecasting Study Sites

The results showed that people predicted floods by priority rank one is wind direction, second comes based on animals, third is based on cycle and flood time, fourth is water color, fifth is vegetation (Table 2). Local people priority based on wind direction and animals still follow the laws of

nature should remain consistent and accurate should preserve and promote this knowledge. Based on the cycle and time of flood, water colors are not as accurate and consistent as before due to human impact.

Table 2. Farmer's Indigenous Knowledge in Flood Forecasting Study Sites

IK	1	2	3	4	5	6	score	Ran king
1		1	3	1	3	1	3	II
2			3	4	5	6	0	V
3				3	3	3	6	I
4					5	4	2	III
5						5	3	II
6							1	IV

Note: (1): Animal behavior observation, (2) Plant observation, (3): Sky and clouds observation, (4) Moon and star observation, (5) Clouds covered the mountainside, (6) Rainbow; IK: Indigenous knowledge

Assessing of Stability for Farmer's Indigenous Knowledge in Weather Forecasting in Study Sites

Results Table 3 shows that people forecasting floods by priority rank 1 is downwind, second comes based on animal behavior observation, third is Flood cycle and flood period, fourth water color, sixth is a plant observation. Priority based on downwind and Animal behavior observation still follow the laws of nature should remain consistent and accurate should preserve and promote this knowledge. Based on the flood cycle and flood period, water colors are not as accurate and consistent as before due to human impact.

Table 3. Farmer's Indigenous Knowledge in Weather Forecasting in Study Sites

IK	1	2	3	4	5	Score	Ranking
1		1	1	4	1	3	II
2			3	4	5	0	V
3				4	3	2	III
4					4	4	I
5						1	IV

Assessing of Stability for Farmer's Indigenous Knowledge in Agriculture Production and Life Activities in Study Sites

Results Table 4 shows that indigenous knowledge of people in agricultural production and life is still accurate and appropriate to preserve and promote this knowledge to local communities. Based on the results of the analysis, farmers in the flood-prone areas have a lot of indigenous knowledge that still holds much valuable indigenous knowledge in adaptation to the agro-products used in agriculture and life.

Table 4. Farmer's Indigenous Knowledge in Agriculture Production and Life Activities

I K	1	2	3	4	5	6	7	8	9	Sc ore	Ran king
1		1	3	1	5	6	1	8	9	3	V
2			3	2	5	2	2	8	9	3	V
3				3	3	3	3	3	9	7	II
4					5	4	4	8	9	2	VI
5						5	5	8	9	5	IV
6							7	8	9	1	VII

7								8	9	1	VII
8									9	6	III
9										8	I

Note: (1): Good soil and bad soil, (2) seed preservation (3): Plant maintenance, (4) the process of a seed starting to grow, (5) Fertilizing, (6) Raising cattle and poultry, (7) Set of scrub to attract more fish, (8) House on stilts, (9) Cure common diseases

In short, the study compiled 39 indigenous knowledge and adaptability to floods and weather forecasts in agricultural production and livelihoods of local people in the study area. In which, there are 31/39 indigenous knowledge still valuable in predicting and adapting to floods. However, this knowledge has not been specifically recorded and stored appropriately for transmission to the latter and widely shared in the community. In addition, there are 8/39 indigenous knowledge that is no longer relevant and misleading compared to the present. It should be considered in the current context due to human impacts and climate change. Therefore, the possibility of flood forecast of the people also decreased, only a small number of people can predict the flood, the weather. It is necessary to increase knowledge and encourage people to combine indigenous knowledge and scientific knowledge to minimize the damage caused by floods.

CONSERVATION MESURES AND PROMOTING INDIGENOUS KNOWLEDGE IN FLOOD ADAPTATION

1. The local knowledge mainly due to collected experience during agricultural production and transferred by word of mouth for the next generation without writing and widely dissemination. Therefore, in order to preserve and promote indigenous knowledge, it should be collected, documented and widely disseminated to the people.

2. Local knowledge becomes less effective due to flood change and extreme weather. Therefore, local knowledge and scientific and technical knowledge should be combined to promote the its values and overcome the limitations.
3. In order to maintain and promote local knowledge, it should be integrated into projects of local development.

CONCLUSION

Indigenous knowledge plays an important role in adapting to changes in the environment. As a national resource, it also contributes to the sustainable development of the local community in inexpensive ways, including the participation of people and achieving sustainable development. Much indigenous knowledge is valuable in predicting and adapting to floods. However, this knowledge has not been specifically recorded and stored appropriately for transmission to the latter and widely shared in the community. Indigenous knowledge of local people is based on the specific characteristics of the organisms and changes in environmental conditions such as warning signals for local people to forecast floods and weather to prepare for appropriate change in production and life. In addition, there is some indigenous knowledge that is no longer relevant and misleading compared to the present. It should be considered in the current context due to human impacts and climate change. Therefore, the possibility of flood forecast of the people also decreased, only a small number of people can predict the flood, the weather. It is necessary to increase knowledge and encourage people to combine indigenous knowledge and scientific knowledge to minimize the damage caused by floods.

IMPLICATION FOR RESEARCH AND POLICY

1. It is necessary to recognize and preserve the remaining indigenous knowledge to accurately predict and adapt to floods

- more efficiently and sustainably, as well as facilitate the exchange and sharing of experiences between the people in the same and other localities.
2. In order to develop local knowledge effectively and sustainably in the future, community knowledge should be strengthened and combined with technological advances to help farmers adapt to environmental changes.
 3. Indigenous knowledge should be documented and learned and shared among local people to predict and adapt to flood changes and extreme weather events.
 4. Indigenous knowledge should be integrated into farmer service system and technical transfer such as providing suitable seed varieties for local conditions.

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APPENDICES





Figure 1. Knowledge of people responding to floods through the model of watermelon growing on water hyacinth



Figure 2. Indigenous knowledge of people doing house in stilts flooring to adapt to flood



Figure 3. Indigenous Knowledge of water measure high flood or Low Flood





Figure 5. Indigenous knowledge of weather forecasters through cloud



Figure 4: Indigenous knowledge of people predicting weather characteristic animals



Figure 6. Indigenous knowledge of people forecasting weather through the moon, railbow





Figure 7. Indigenous knowledge of local people viewing good soil through environmental tests (algae, moss)



Figure 8. Household interviews and group discussions about people's adaptation to floods

